

What is claimed is:

1. Apparatus for remotely charging and storing energy to operate a tool positioned in a well, comprising:

5 a tool body having a central bore formed therethrough;

a moveable piston arranged in the tool body;

a spring arranged in the tool body, the spring adapted to engage the piston; and

a latching mechanism adapted to selectively lock the piston to the tool body,

wherein energy is charged by moving the piston to compress the spring, and

10 wherein energy is stored by locking the piston once the spring is compressed.

2. The apparatus of claim 1, wherein the piston is adapted to be moved by differential pressure between the well and the spring.

15 3. The apparatus of claim 2, wherein the spring comprises:

a gas chamber formed in the tool body; and

a compressible gas located in the gas chamber.

4. The apparatus of claim 3, wherein the piston is arranged in the gas  
20 chamber.

5. The apparatus of claim 3, wherein the gas comprises nitrogen.

6. The apparatus of claim 2, wherein the spring comprises:

a mechanical spring.

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7. An actuator for use in a wellbore, comprising:

a tool body having a bore and a gas chamber formed therein, the gas chamber adapted to hold a compressible gas, the bore adapted to receive a fluid;

10 a moveable piston arranged in the gas chamber, the piston dividing the gas chamber into two portions;

a latching mechanism that selectively prevents the piston from moving; and

a port providing fluid communication between the bore and one portion of the gas chamber,

15 wherein the actuator is charged with energy downhole by moving the piston to compress the gas in the gas chamber using pressure in the wellbore.

8. The actuator of claim 7, further comprising:

a sleeve arranged in the tool body for defining the bore and the gas chamber.

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9. The actuator of claim 8, wherein the latching mechanism comprises:

a ratchet formed on the piston; and

a mating surface formed on the sleeve, the mating surface adapted to engage the piston and selectively lock the piston to the sleeve.

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10. The actuator of claim 7, further comprising a second latching mechanism, the second latching mechanism comprising:

a latching finger formed on the piston; and

10 a recess formed in the tool body for receiving the latching finger to selectively latch the piston to the tool body.

11. The actuator of claim 7, wherein the compressible gas comprises nitrogen.

12. The actuator of claim 7, wherein the pressure in the wellbore is the  
15 differential pressure between pressure of the gas in the gas chamber and pressure of the fluid in the bore.

13. The actuator of claim 7, wherein the latching mechanism comprises a shearing mechanism adapted to selectively release the piston at a predetermined pressure.

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14. The actuator of claim 7 wherein the piston comprises a rupture disk adapted to break and release the piston at a predetermined pressure.

15. The actuator of claim 14, wherein the latching mechanism comprises a shearing mechanism adapted to selectively release the piston at a predetermined pressure.

5 16. The actuator of claim 7, wherein tool body is connected to a downhole tool.

17. The actuator of claim 16, wherein the downhole tool is a valve.

18. A method for energizing a tool in a well, comprising:  
10 lowering the tool into the well;  
using pressure in the well to compress a spring member in the tool; and  
holding the spring member in a compressed state to store energy.

19. The method of claim 18, wherein the spring member is a gas spring.  
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20. The method of claim 18, wherein the spring member is a mechanical spring.

21. The method of claim 18, further comprising:  
20 using the stored energy to actuate the tool by decompressing the spring.

22. The method of claim 21, wherein the tool is a valve.

23. A method, comprising:

running a tool in a well;

5 using pressure in the well to move a piston in the tool to compress a gas;

locking the piston in the tool to prevent the gas from decompressing; and

using the compressed gas to actuate the tool.

24. The method of claim 23, wherein locking the piston is achieved by  
10 ratcheting the piston to an inner sleeve in the tool.

25. A method for actuating a valve in a well, the method comprising:

connecting the valve to an actuator;

running the valve downhole;

15 using pressure in the well to compress a gas in the actuator;

holding the gas in a compressed state to store energy in the actuator for actuating  
the valve; and

decompressing the gas to actuate the valve.

26. The method of claim 25, wherein compressing the gas is achieved by moving a piston in the actuator.

27. The method of claim 23, wherein holding the gas in a compressed state is  
5 achieved by ratcheting the piston to an inner sleeve in the actuator.

28. A method for actuating a valve in a well, the method comprising:

connecting the valve to an actuator;

running the valve downhole;

10 using pressure in the well to compress a mechanical spring;

holding the mechanical spring in a compressed state to store energy in the actuator for actuating the valve; and

decompressing the mechanical spring to actuate the valve.

15 29. An energy storage apparatus for receiving and storing an energy charge for actuating a downhole tool arranged in a wellbore, the energy storage apparatus comprising:

a body connectable to the downhole tool;

20 a sleeve arranged within the body, the sleeve defining a central bore and a chamber;

a moveable piston arranged in the chamber, the piston dividing the chamber into two portions;

a port adapted to communicate well fluid from the bore to one portion of the chamber;

a compressible gas arranged in the other portion of the chamber, the gas being compressible by the piston; and

- 5           a ratcheting mechanism to selectively hold the piston to compress the gas, the ratcheting mechanism adapted to release the piston at a predetermined pressure.

30.     The apparatus of claim 29, further comprising:

- 10           a latching mechanism to selectively hold the piston to prevent the piston from moving during initial running of the downhole tool in the wellbore, the latching mechanism adapted to release the piston at a predetermined pressure.